USFS AVERY RANGER STATION (PWSNO 1400057)
SOURCE WATER ASSESSMENT REPORT

March 26, 2003

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This risk assessment is based on a land use inventory in the well recharge zone, sensitivity factors associated with how the well was constructed, and aquifer characteristics.

This report, *Source Water Assessment for USFS Avery Ranger Station*, describes the public drinking water well; the well recharge zone and potential contaminant sites located inside the recharge zone boundaries. This assessment, taken into account with local knowledge and concerns, should be used as a planning tool to develop and implement appropriate protection measures for this public water system. **The results should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system.**

A single well completed in an alluvial aquifer paralleling the St. Joe River supplies drinking water for the USFS Avery Ranger Station. The water system serves an average daily population of 74 people who live and work at the station 5 miles west of Avery, Idaho. A susceptibility analysis conducted by the Idaho Department of Environmental Quality February 14, 2003 ranked the well highly susceptible to microbial and inorganic chemical contamination. Sanitary sewer lines approximately 42 feet northeast of the well impinge on the sanitary setback established under the *Idaho Rules for Public Drinking Water Systems*, putting the well at risk of contamination. The well's susceptibility relative to synthetic and volatile organic chemical contaminants is moderate, mostly because of risk factors related to local geology.

It is important to remember that activity near a well is more likely to cause contamination problems than activities elsewhere in the recharge zone. *Idaho Rules for Public Drinking Water Systems* specify a minimum setback between public wells and sewer lines of 50 feet. It may be necessary to move the lines or to apply for a waiver from the required setback distances. In many cases, inexpensive changes can greatly reduce the risk of a well becoming contaminated. The ranger station should develop a facilities management plan to ensure proper storage of maintenance chemicals, equipment and fuel. All water users should be educated about cross connection control. Back siphonage from stock tanks and irrigation systems is a particular concern in a rural neighborhood. The station should also have a water emergency response plan.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a “pristine” area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

Due to the time involved with the movement of ground water, source water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. For assistance in developing protection strategies, please contact your regional Department of Environmental Quality office or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR USFS AVERY RANGER STATION

Section 1. Introduction - Basis for Assessment

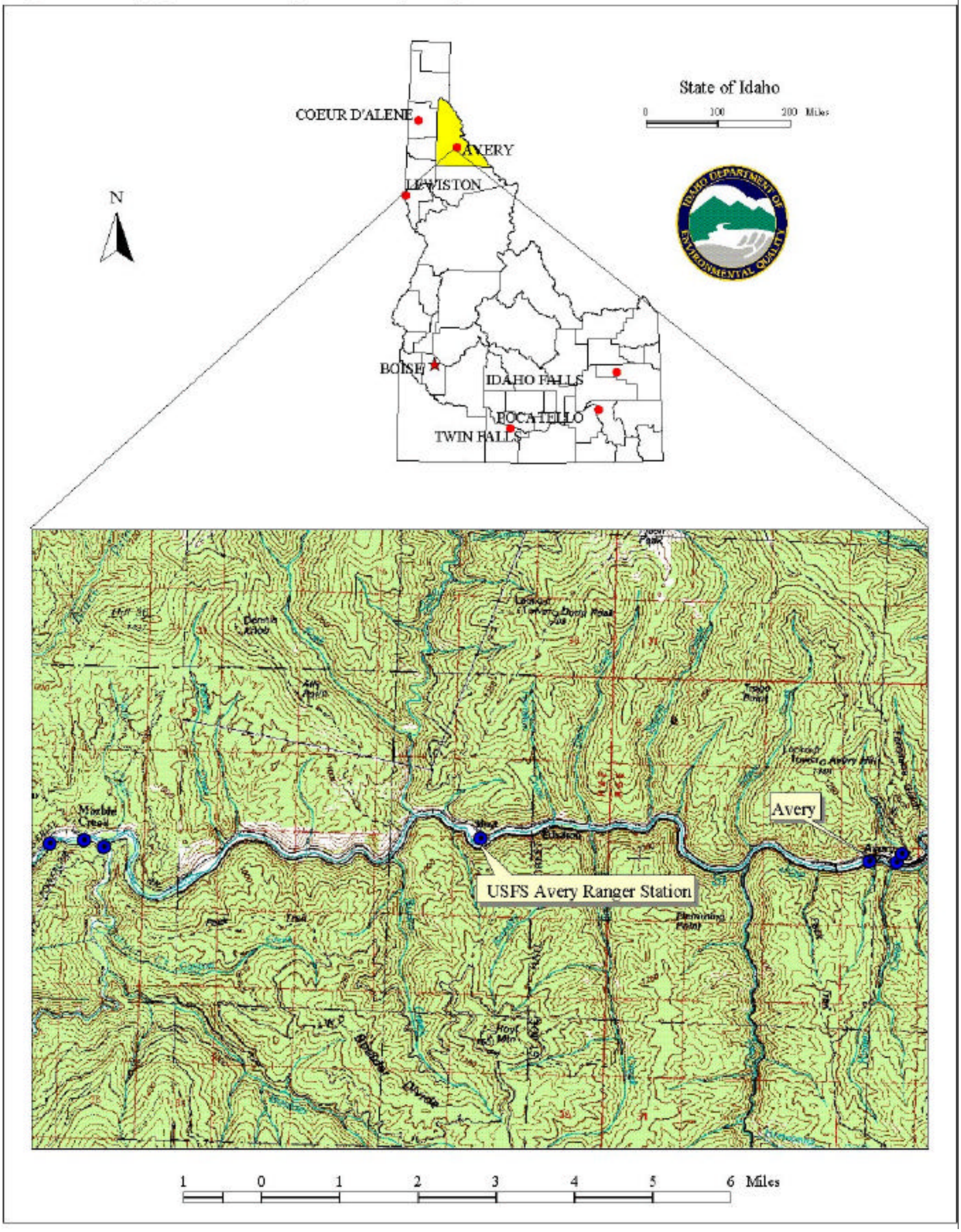
The following sections contain information necessary for understanding how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this source means.** A map showing the delineated source water assessment area and an inventory of significant potential sources of contamination identified within that area are included. The ground water Susceptibility Analysis Worksheet used to develop this assessment is attached.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess every public drinking water source in Idaho for its relative susceptibility to contaminants regulated by the Safe Drinking Water Act. These assessments are based on a land use inventory inside the delineated recharge zones, sensitivity factors associated with how the well is constructed, and aquifer characteristics. The state must complete more than 2900 assessments by May of 2003. Because resources and the time available to accomplish assessments are limited, an in-depth, site-specific investigation for every public water system is not possible.

The results of the source water assessment should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system. The ultimate goal of this assessment is to provide data to local communities for developing a protection strategy for their drinking water supply. The Idaho Department of Environmental Quality recognizes that pollution prevention activities generally require less time and money to implement than treating a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a source water protection program should be determined by the local community based on its own needs and limitations. Wellhead or source water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

Figure 1. Geographic Location of USFS Avery Ranger Station



Section 2. Preparing for the Assessment

Defining the Zones of Contribution - Delineation

The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the well recharge area into time of travel zones indicating the number of years necessary for a particle of water flowing through the aquifer to reach a well. The ground water flow model used data assimilated by DEQ from a variety of sources including local well logs and pumping volume estimates for the Avery Ranger Station well.

The Avery Ranger Station water system provides drinking water for a U.S. Forest Service installation and homes at Hoyt Flats on the St. Joe River. The system serves an estimated daily population of 74 at the station 5 miles west of Avery, Idaho (Figure 1). The well is 50 feet deep with an estimated capacity of 110 gpm.

The source water assessment delineation for the Avery Ranger Station well encompasses 375 acres divided into 0-3, 3-6 and 6-10 year time of travel zones. Three specific capacity tests for wells in the Avery/Calder vicinity show a drawdown of 0 to 4 feet for multi-hour tests. This result indicates that the cone of depression reached a source of constant recharge. With the wells drilled into the alluvium and close to the St. Joe River, the implication is that the wells are producing river water that has been filtered through the alluvium. Ground water flow simulations were run with a hydraulic conductivity of 200 feet per day. The thickness of aquifer was estimated to be 10 feet, with a porosity value of 0.2, and a recharge value of 1 foot per year. The extent of the alluvium to the north and south of the St. Joe River determined boundary conditions for the model in this area. The length of the Avery Ranger Station delineation was determined by an estimate of the velocity using the gradient of the topography. The width was arbitrarily set as a 400-foot buffer to either side of the St. Joe River. The resulting recharge zone is illustrated in Figure 2.

Identifying Potential Sources of Contamination

The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. Inventories for all public water systems in Idaho were conducted in two-phases. The first phase involved identifying and documenting potential contaminant sources within a system's source water assessment area through the use of computer databases and Geographic Information System maps developed by DEQ. Maps showing the delineations and tables summarizing the results of the database search were then sent to system operators for review and correction during the second or enhanced phase of the inventory process. Niell Ott reviewed the inventory for Avery School. Information from the system's file was also incorporated into the potential contaminant inventory.

Figure 2, *Avery Ranger Station Delineation and Potential Contaminant Inventory* of this report shows the location of the Avery Ranger Station well, the recharge zone delineation boundaries, and potential contaminant sites in the vicinity.

Many potential sources of contamination are regulated at the federal level, state level, or both to reduce the risk of release. When a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation.

Section 3. Susceptibility Analysis

The susceptibility to contamination of all ground water sources in Idaho is being assessed on the following factors:

- physical integrity of the well,
- hydrologic characteristics,
- land use characteristics, and potentially significant contaminant sources
- historic water quality

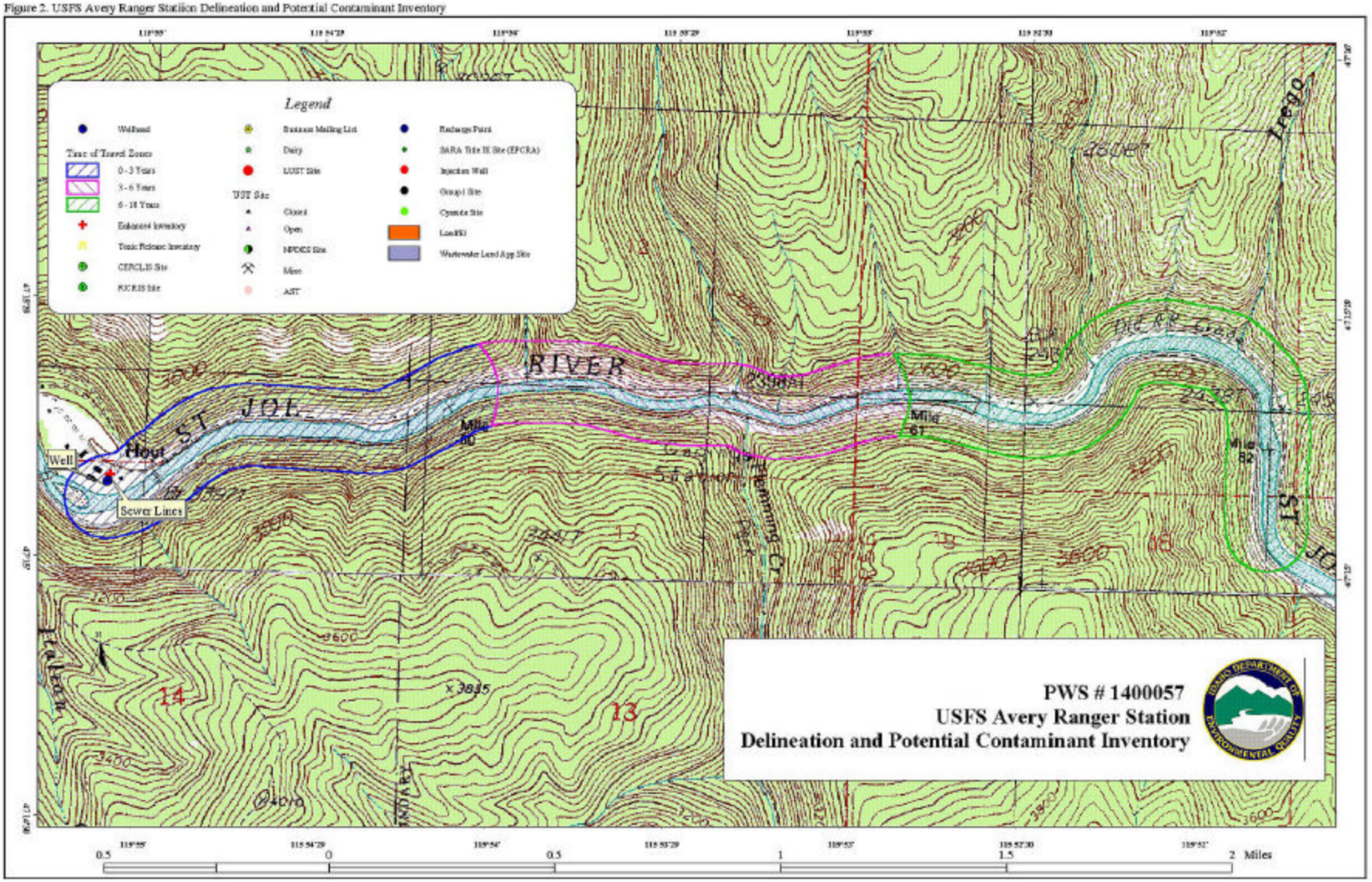
The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. A high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each well is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. The following summaries describe the rationale for the susceptibility ranking. The Susceptibility Analysis Worksheet for the Avery Ranger Station well, Attachment A, shows in detail how the well was scored.

Well Construction

Construction factors directly affect the ability of well to protect ground water quality. Lower scores imply a well that can better protect the water. This portion of the susceptibility analysis relies on information from individual well logs and from the most recent sanitary survey of the public water system. The well log for the Avery Ranger Station well is on file with DEQ. No serious deficiencies in the wellhead and surface seal maintenance were noted during a sanitary survey in 1999.

The Avery Ranger Station well was drilled in 1965 to a depth of 50 feet. The 8-inch steel casing extends from less than a foot above ground to the full depth of the well where it terminates in fractured bedrock. The casing is perforated from 37.5 to 48.5 feet. Static water level is 33 feet below land surface. Unperforated casing should extend at least 5 feet below the water table according to current Idaho Department of Water Resources well construction standards. The permanent casing should project at least 12 inches above the surrounding concrete slab and 18 inches above finished grade. The well is apparently above the 100-year flood plain and about 150 feet north of the St. Joe River. A ground water under direct influence of surface water (GWUDI) inspection in 1999 concluded that further testing is needed to determine whether the well is surface water influenced. Wells directly influenced by surface water can contain disease organisms normally found only in surface waters

Figure 2. USFS Avery Ranger Station Delineation and Potential Contaminant Inventory



Hydrologic Sensitivity

Hydrologic sensitivity scores reflect natural geologic conditions at the well site and in the recharge zone. Information for this part of the analysis is derived from individual well logs and from the soil drainage classification inside the delineation boundaries. The Avery Ranger Station well scored 6 points out of 6 points possible in the hydrologic sensitivity portion of the susceptibility analysis.

Soils in the recharge zone generally are composed of moderately well to well drained materials. Soils that drain rapidly are deemed less protective of ground water than slowly draining soils. At the well site, a mixture of boulders, gravel and clay is found in the soil column above the water table. Water was first encountered 38 feet below the surface.

Potential Contaminant Sources and Land Use

Figure 2, *Avery Ranger Station Delineation and Potential Contaminant Inventory* on page 7 shows the location of the Avery Ranger Station well, and the zone of contribution DEQ delineated for it. The ranger station and housing occupy land near the well. The remaining area is undeveloped forest. The public water system file for Avery Ranger Station shows sewer lines about 42 feet northeast of the well. IDAPA 16.01.08 specifies a minimum 50-foot separation distance between wells and sanitary sewers. In addition to microbial contaminants, sewage is a potential source of nitrates.

Historic Water Quality

Other than sporadic incidents of total coliform bacteria contamination, Avery Ranger Station has had few water quality problems. The Ranger Station tests monthly for total coliform. In the period from January 1998 through January 2003 routine samples taken in August and October 1998, February, April, October and November 1999 were positive. Total coliform bacteria were absent in samples tested in the intervening months. The contamination was confined to the distribution system. As shown on the table below, mercury was detected at a concentration exceeding the Maximum Contaminant Level in September 1982, but was not found in samples tested in following years. The station's chemical and radiological sampling history is summarized on Table 1.

Table 1. Avery Ranger Station Sampling Results

Primary IOC Contaminants (Mandatory Tests)							
Contaminant	MCL (mg/l)	Results (mg/l)	Dates	Contaminant	MCL (mg/l)	Results (mg/l)	Dates
Antimony	0.006	ND	10/5/95, 2/24/99	Nitrate	10	ND to 0.127	9/23/82 through 7/24/02
Arsenic	0.01	ND	9/23/82 through 7/24/02	Nickel	N/A	ND	10/5/95, 2/24/99
Barium	2.0	ND	9/23/82 through 2/24/99	Selenium	0.05	ND	9/23/82 through 2/24/99
Beryllium	0.004	ND	10/5/95, 2/24/99	Sodium	N/A	1.19 to 11.9	9/23/82 through 7/24/02
Cadmium	0.005	ND	9/23/82 through 2/24/99	Thallium	0.002	ND	10/5/95, 2/24/99
Chromium	0.1	ND	9/23/82 through 2/24/99	Cyanide	0.02	ND	10/5/95
Mercury	0.002	ND 0.117	9/23/82 through 2/24/99 9/23/82	Fluoride	4.0	ND to 1.4	10/29/80 to 2/24/99

Secondary and Other IOC Contaminants (Optional Tests)			
Contaminant	Recommended Maximum (mg/l)	Results (mg/l)	Dates
Sulfate		3.06, 2.5	10/5/95, 2/24/99

Regulated and Unregulated Synthetic Organic Chemicals		
Contaminant	Results	Dates
29 Regulated and 13 Unregulated Synthetic Organic Compounds	None Detected	8/16/93, 2/24/99

Regulated and Unregulated Volatile Organic Chemicals		
Contaminant	Results	Dates
21 Regulated And 16 Unregulated Volatile Organic Compounds	None Detected	8/16/93, 2/24/99

Radiological Contaminants			
Contaminant	MCL	Results	Dates
Gross Alpha, Including Ra & U	15 pCi/l	ND to 1.6 pCi/l	12/21/79 through 12/19/01
Gross Beta Particle Activity	4 mrem/year 50 pCi/l	0.9 to 3.5 mrem 1.6 pCi/l	12/21/79 through 12/5/97 12/19/01

Final Susceptibility Ranking

The Avery Ranger Station well automatically ranked highly susceptible to microbial and inorganic chemical contamination because of sanitary sewer lines located about 42 feet northeast of the well. The minimum separation distance between a public well and sanitary sewers is 50 feet. The well is moderately susceptible to volatile and synthetic organic chemical contamination. Most the points counted against the well in the final susceptibility scores derive from the location of the well in a shallow alluvial aquifer. Other than surface water and the station facilities, there are no potential contaminant sources documented inside the well recharge zone. Total scores for system construction and hydrologic sensitivity along with the cumulative scores for land use and potential contaminant sites are shown on Table 2. The complete Susceptibility Analysis Worksheet for the Avery Ranger Station well is in Attachment A.

The final scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score =
   Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.2)
2) Microbial Final Score =
   Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.35)

If there are no contaminants in the sanitary setback zone, final ranking categories are determined as follows:

- 0 - 5 Low Susceptibility
- 6 - 12 Moderate Susceptibility
- > 13 High Susceptibility.

Table 2. Summary of Avery Ranger Station Susceptibility Evaluation

Cumulative Susceptibility Scores						
Well Name	System Construction	Hydrologic Sensitivity	Contaminant Inventory			
			IOC	VOC	SOC	Microbial
Well #1	5	6	2	2	2	4
Final Susceptibility Score/Ranking						
	IOC		VOC	SOC		Microbial
Well #1	*High		11/Moderate	11/Moderate		*High

*High due to presence of sanitary sewer lines inside sanitary setback zone.
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Section 4. Options for Source Water Protection

The susceptibility assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what the susceptibility ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

It is important to remember that activity near a well is more likely to cause contamination problems than activities elsewhere in the recharge zone. A map of the area within 500 feet of the well that was prepared as part of the initial GWUDI evaluation shows three sanitary sewer lines branching from a point approximately 42 feet northeast of the well. Ranger Station maintenance personnel should measure the distance from the well to this potential source of contamination. *Idaho Rules for Public Drinking Water Systems* specify a minimum setback between public wells and sanitary sewers of 50 feet. It may be necessary to relocate the lines or to apply for a waiver from the required setback distance.

It might be helpful for the Ranger Station to investigate ground water stewardship programs like Home*A*Syst. These programs help well owners assess everyday activities for their potential for polluting their water source. In many cases, inexpensive changes can greatly reduce the risk of a well becoming contaminated. The ranger station should develop a facilities management plan to ensure proper storage of maintenance chemicals, equipment and fuel. All water users should be educated about cross connection control. Back siphonage from stock tanks and irrigation systems is a particular concern in a rural neighborhood. The station should also have a water emergency response plan. There is a simple fill-in-the-blanks form available on the DEQ website to guide systems through the process.

Assistance

Public water suppliers and users may call the following IDEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the IDEQ office for preliminary review and comments.

Idaho Department of Environmental Quality

Coeur d'Alene Regional IDEQ Office	(208) 769-1422
State IDEQ Office, Boise	(208) 373-0502
Website:	http:\\ww.deq.state.id.us/water/water1.htm

Idaho Rural Water Association

Melinda Harper, Groundwater Protection Specialist	(800) 962-3257
Website:	http://www.idahoruralwater.com

References Cited

Freeze, R.A., and J.A. Cherry, 1979, Groundwater, Prentice-Hall, Inc., 604 p.

Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 1997. "Recommended Standards for Water Works."

Idaho Department of Environmental Quality, 1997. Design Standards for Public Drinking Water Systems. IDAPA 58.01.08.550.01.

Idaho Division of Environmental Quality, 1999, Idaho Source Water Assessment Plan, October, 39 p.

Idaho Division of Environmental Quality, 1997, Idaho Wellhead Protection Plan, Idaho Wellhead Protection Work Group, February.

Idaho Department of Water Resources, 1993. Administrative Rules of the Idaho Water Resource Board: Well Construction Standards Rules. IDAPA 37.03.09.

Theis, C.V., 1935, The Relation between Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Groundwater Storage, Trans. Amer. Geophysical Union, v. 16, pp. 519-524.

Attachment A

USFS Avery Ranger Station
Susceptibility Analysis Worksheet

Ground Water Susceptibility

Public Water System Name : **USFS AVERY RANGER STATION** Source: **WELL #1**

Public Water System Number : **1400057** 2/14/03 11:25:16 AM

1. System Construction		SCORE			
Drill Date	7/17/65				
Driller Log Available	YES				
Sanitary Survey (if yes, indicate date of last survey)	YES	1999			
Well meets IDWR construction standards	NO	1			
Wellhead and surface seal maintained	YES	0			
Casing and annular seal extend to low permeability unit	NO	2			
Highest production 100 feet below static water level	NO	1			
Well located outside the 100 year flood plain	NO	1			
Total System Construction Score		**5**			
2. Hydrologic Sensitivity					
Soils are poorly to moderately drained	NO	2			
Vadose zone composed of gravel, fractured rock or unknown	YES	1			
Depth to first water > 300 feet	NO	1			
Aquitard present with > 50 feet cumulative thickness	NO	2			
Total Hydrologic Score		**6**			
		IOC	VOC	SOC	Microbial
3. Potential Contaminant / Land Use - ZONE 1A (Sanitary Setback)		Score	Score	Score	Score
Land Use Zone 1A	Ranger Station	2	2	2	2
Farm chemical use high	NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A	Sanitary Sewer Lines	YES	NO	NO	YES
Total Potential Contaminant Source/Land Use Score - Zone 1A		**2**	**2**	**2**	**2**
Potential Contaminant / Land Use - ZONE 1B (3 YR. TOT)					
Contaminant sources present (Number of Sources)	YES. Surface Water	0	0	0	1
(Score = # Sources X 2) 8 Points Maximum		0	0	0	2
Sources of Class II or III leacheable contaminants or Microbials	NO	0	0	0	
4 Points Maximum		0	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		**0**	**0**	**0**	**2**
Potential Contaminant / Land Use - ZONE II (6 YR. TOT)					
Contaminant Sources Present	NO	0	0	0	
Sources of Class II or III leacheable contaminants or Microbials	NO	0	0	0	
Land Use Zone II	Less than 25% Agricultural Land	0	0	0	
Potential Contaminant Source / Land Use Score - Zone II		**0**	**0**	**0**	**0**
Potential Contaminant / Land Use - ZONE III (10 YR. TOT)					
Contaminant Source Present	NO	0	0	0	
Sources of Class II or III leacheable contaminants or Microbials	NO	0	0	0	
Do irrigated agricultural lands occupy > 50% of Zone	NO	0	0	0	
Total Potential Contaminant Source / Land Use Score - Zone III		**0**	**0**	**0**	**0**
Cumulative Potential Contaminant / Land Use Score		**2**	**2**	**2**	**4**
4. Final Susceptibility Source Score		**11**	**11**	**11**	**12**
5. Final Well Ranking		***High**	Moderate	Moderate	***High**

*High due to presence of sewer lines inside Sanitary Setback

POTENTIAL CONTAMINANT INVENTORY
LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLIS – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as ? Superfund? is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RICRIS – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

Where possible, a list of potential contaminant sites unable to be located with geocoding will be provided to water systems to determine if the potential contaminant sources are located within the source water assessment area.